# TEXTILE RESEARCH

*Publication of Textile Research Institute, Inc., and The Textile Foundation*

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# TEXTILE RESEARCH

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# In This Month's Issue

### Continuous Paging

*In Vol. XIV the pages will be numbered consecutively throughout the volume instead of paging each issue separately.*

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### Executive and Technologist

"The technologist should be at the executive's right hand, not at his beck and call" states Douglas G. Woolf. "He should be, in fact, an executive on his own. That sort of set-up is the first item in textile post-war planning. If we get back to the dime-a-dozen attitude toward technical men, the textile industry might as well fold up, liquidate its quick assets, and let the paper industry and other industries supply the world with textiles." (See page 34.)

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### The Grex Universal Numbering System

A proposed universal system for the numbering of yarns, slivers and fibers, based on direct units, is under consideration by the American Society for Testing Materials. (See page 36.)

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### The Philadelphia Textile Institute

The growing number of important research organizations that are connected with educational institutions is in recognition of the inevitable connection between research and education. Although it has been in operation only a year, results are demonstrating the value of the program of research for industry at the Philadelphia Textile Institute. (See page 42.)

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### The Shirley Analyzer

A description is given of the Shirley Waste Analyzer and its application to both qualitative and quantitative analysis of the waste contained in cotton lint. (See page 50.)

**The Post-War Era Demands Close Cooperation Between**

# Executive and Technologist

**By DOUGLAS G. WOOLF**

The line of class-consciousness between executive and technologist in the textile industry is being softened. It must be eliminated in the post-war era if the full results of research are to be realized.

The distinction is a hangover from the distant past. At one time, there was a boss, and there was, let us say, a green chemist working at $15 a week. (I didn't pick that figure out of the air. It happens to be the salary I started at, just 32 years ago. I'm not kicking; it seemed like big money then, and I probably wasn't worth it.)

Today the program is different. The technical staff of a mill is at least as important as the executive staff. But neither the executive nor the technologist fully realizes the implications of that change in relationship.

The fault has been two-sided. The executive has too often regarded his technical men as hired men. He has bought them as cheaply as he could, and has given them raises grudgingly when a competitor made a pass at them. He has been apt to regard them as necessary evils. He has met with his fellow manufacturers in solemn conclave at association meetings, from which the technical men were at least psychologically barred—and too often physically barred by absence of expense-account rating.

The technical man, on the other hand, has had a superior, looking-down-the-nose attitude toward his boss. He had been to college—and maybe his boss hadn't. He knew the technical lingo—and his boss didn't. He, in turn, went to his professional-society meetings, from which the executives are psychologically barred, and joined with his fellow technicians in "grouch" sessions at which the executives were the targets in absentia.

## The Real Trouble

But the fundamental disparity of viewpoints stemmed from an inherent weakness in the textile industry itself. It is trite to say that the industry has not been research-minded in the past, but it is true—and is in fact the compelling problem. Nor is it surprising that this is so. For too many years, textile manufacture was a simple business of producing goods by long-established processes, and selling them at a profit, with a side-show in raw-material speculation whose box-office returns often eclipsed those of the big tent.

But today the program is different. And the really surprising fact is that only recently has the industry realized that the program *is* different, that it

has been different for the last quarter-century, and that it is going to get increasingly more different—and more difficult—in the next quarter-century. It would seem that the experiences of the 1920's and 1930's, involving the complete liquidation of the erstwhile great silk-weaving industry, and the bankruptcy of erstwhile great New England cotton mills, would have brought that fact home. It didn't. There was still a nostalgic search for status quo. If that search continues, there will be a post-World-War II liquidation of companies and individuals which will make the post-World-War I liquidation look like a mild laxative compared to a purge.

In such a purge, there is one sure bet: the executives have more to lose than have the technologists. The former are tied, or think they are, to an industry. The latter are not; they can accept a call from other industries, and move in practically overnight. The textile industry will suffer a major loss thereby.

My files over the last quarter-century are filled with letters from, and summaries of interviews with, scientists who wanted to get into, or out of the textile industry. Too many of those men (and women) didn't get in, or got out. Their common complaint was that "the textile industry doesn't offer an attractive future to technologists." And, in the main, they were right.

From now on, the program must be different.

The fact that technically trained personnel has been at a premium during the defense and war periods is no assurance for the future. There is sure to be a reaction. As demand declines, and tax burdens become stiffer, executives will be apt to cut expenses via their technical staffs. That is the most expensive form of economy imaginable. The tougher the going, the more vital research men become.

That is the one hard cold fact which has never been learned by the textile industry, but which must be learned now. Research is not a luxury for lush times; it is a must for lean times.

If we get back to the dime-a-dozen attitude toward technical men, the textile industry might as well fold up, liquidate its quick assets, and let the paper industry and other industries supply the world with textiles.

### Something Else Beside Money

But this is not only a question of money, of salaries. Technologists are strange animals, just as are most professional men. They want to live comfortably, of course, and to provide adequately for their families, but more than that they want to make progress. They want to feel that they are an integral part of the industry to which they offer allegiance. They want to feel a sense of responsibility: a realization that they are vital cogs in a vital machine. They want a future, not only in terms of thousands of dollars a year, but more especially in terms of contribution to their industry's progress, and to the public interest.

What is needed most is more research-minded executives, and more financial-minded technologists. This business of textile manufacture is a matter of team-play.

The technologist should be at the executive's right hand, not at his beck and call. He should be, in fact, an executive on his own. That sort of set-up is the first item in textile post-war planning.

**The American Society for Testing Materials Offers Additional Information in Regard to**

# The Grex Universal Numbering System*

**By A. G. SCROGGIE**

*At the recent fall, 1943, meeting of Committee D–13 of the American Society for Testing Materials, it was decided by Subcommittee B–2 on Nomenclature and Definition to place before the Textile Industry for its consideration a proposal for a universal yarn numbering system. The January issue* of TEXTILE RESEARCH *carried a digest of the first of a series of papers by A. G. Scroggie, chairman of Subcommittee B–2, discussing the "Grex" unit. The following article gives further pertinent information and deals particularly with the adoption of the unit in mills operating on other systems.*

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In these discussions, the author is presenting what appear to him to be the major problems to be considered by any mill adopting "Grex" units. The principal point to remember is that the mechanical conversion involves a few simple changes that can be made in most shops, and the preparation of some new conversion tables fitted to the particular work being carried out. These difficulties are probably academic. A more serious problem is the change in thinking that will be required when certain industries adopt direct units. In this connection, the author can say that he is familiar with a mill that changed from a reciprocal to a direct unit, which was being used to control a routine operation. The preparation of the necessary conversion tables and a short educational campaign resulted in practically no trouble, and the old system was soon forgotten, once the merits of the new direct units were apparent.

### Conversion of Testing Instruments

Yarn reels are generally made with six equal "segments" and a perimeter of 1 yard for wool, 1.5 yards for cotton, and 1.125 meters for silk and rayon. Any reel can, accordingly, be adjusted to have a perimeter of one meter by making the spokes 1/6 of a meter long (16.7 cm. or 6.56 inches). This is a change which can be carried out readily in most shops.

In addition to changing the perimeter, it will be desirable to calibrate the dial in meters and to change the gear controlling the dial so that it will make one revolution for 100 meters or 100 revolutions of the reel. This change does not have to be made in order to use a cotton reel, since it is possible to reel 109.3 yards (100 meters), and remove the skein at this point, or to reel the usual skein of 80 turns—each 1.5 yards, and multiply the weight by 0.9113 to convert the weight of the 120 yards to a 100 meter basis.

* Grex = Grams per 10,000 meters.

Balances with arms graduated in terms of grains cannot be converted readily to weigh in grams, but could be used with special length skeins or with a suitable conversion table. Universal yarn numbering balances (graduated in mgms.) would not have to be changed for use with meter lengths.

Where quadrants are used for weighing, new scales could be substituted without difficulty and with no loss of accuracy. As a temporary measure, a paper scale showing equivalent "Grex" numbers could be stuck on existing scales to facilitate reporting in both units during a transition period.

### Use of Grex Yarn Numbers

1. SINGLE YARNS. Yarn number can be determined according to current procedures and the corresponding "Grex" unit obtained by reference to an appropriate curve or conversion table.

Whenever lengths are measured in meters and weighed in grams, "Grex" units can be obtained directly without the use of any table or complicated calculation.

The adoption of "Grex" units would not require the manufacture of yarns of different numbers. The same yarn sizes could be sold under the corresponding "Grex" numbers; for a period, it would probably be desirable to quote both "Grex" numbers and the units previously used. Thus, yarns would be sold as 110 grex (100 denier) rayon, silk, nylon, etc.; 52 grex (60/1) woolen; 295 grex (20/1) cotton or 4.96 kilogrex (10.0 cut) glass or asbestos. If it is desired to market yarns with round numbers and avoid decimal fractions, 50 grex woolen yarns, 300 grex cotton yarn, and 5.0 kilogrex glass yarn could be sold. In most cases, the small differences involved are within the normal variations of current deliveries of the nominal yarn number now marketed.

2. PLIED YARN NUMBERS. Calculations of plied yarn numbers from single yarn numbers are simple in both direct and reciprocal systems when only one size of single yarn is being used. However, when yarns of different fineness are plied, the calculations are very much simpler with direct units.

Thus, when plying a 100 grex with a 50 grex yarn, the EQUIVALENT SINGLE NUMBER of the plied yarn will be $100 + 50 = 150$ grex—obtained by simple addition. However, when using reciprocal units, plying a 100 count yarn with a 50 count yarn gives a 33.3 count yarn, calculated by the following formula:

$$\frac{A \times B}{A + B} = \text{Equivalent single yarn number of the plied yarn, when A and B are the numbers of the single yarns.}$$

The calculation of the equivalent single number of a plied yarn, twisted from equal amounts of three yarns, having different single yarn numbers, such as 100.50, 75.25, and 50.25, is made as follows:

For direct grex units: $100.50 + 75.25 + 50.25 = 226.0$

For reciprocal units—hanks, cuts, runs, leas, etc.:

$$\frac{100.50 \times 75.25}{100.50 + 75.25} = 43.03$$

and

$$\frac{43.03 \times 50.25}{43.03 + 50.25} = 23.18$$

The advantages of the direct units for such calculations are obvious. Note: The calculated equivalent single

yarn numbers differ from the observed plied yarn numbers in both direct and reciprocal systems, unless corrected for take-up during twisting.

Direct units have the advantage that a unit difference in yarn number has the same absolute value at any part of the number scale.

3. Control of Yarn Manufacture. When using the "Grex" system, yarn, roving, and sliver would be measured in the same or proportional units. This will facilitate making any adjustment required in spinning operations, particularly in view of the uniformity of number differences discussed above.

Assume, for example, that a mill is spinning a 200 grex cotton yarn from a 20,000 grex sliver, and wishes to cut the number to 150 grex yarn without changing the draft setting. Then a corresponding change would be made in the roving, which would be cut from 20,000 to 15,000. The cut is directly proportional and in the same direction. The same change would be made in strict proportion to bring the sliver down to the right weight for the new roving.

On the other hand, when spinning yarns numbered in reciprocal units, if it is proposed to increase the yarn size by a specific amount, this must be calculated to a percentage basis, and the same percentage change made in the same direction in the roving, but in the opposite direction in the sliver or top.

It is understood, of course, that the change in weight of the sliver might have to be accompanied by adjustment of drafting or twisting factors for both direct and reciprocal units.

4. Twist in Yarn. In the cotton industry, it is common practice to calculate the twist to be put into a yarn by means of a twist multiplier, using the formula: Turns per Inch = Twist Multiplier × Cotton Count

When using "Grex" units, the corresponding formula is:

$$\text{Turns per Inch} = \text{Twist Multiplier} \times \frac{5905}{\text{Grex count}}$$

Strength Testing. Because individual fibers can be measured in terms of "Grex" units, it is possible to compare grams per "Grex" strength for the raw fibers or filaments, with the strength after any subsequent spinning or other textile operation. In this way, it is easy to evaluate simply and clearly, the effect of any textile or chemical operation on the strength of the fiber or yarn.

## Fabric Costs and Conversions

In order to determine the cost of the yarn in a fabric of designated construction, the calculation, when using "Grex" numbers, would be identical with that now in use, the only additional requirement being a table showing yards per pound corresponding to various "Grex" yarn numbers.

It is frequently desirable to design a fabric which will duplicate the weight, or strength, of an existing fabric, by using yarns of a different number or even yarns made from a different fiber. The general use of a single, direct unit such as the "Grex" would greatly facilitate calculations of this type, since all weights, lengths, and yarn numbers would be in direct proportion at all points on the yarn number scale.

If all fibers were numbered in the same system, the substitution of different fibers with the same number

would not affect weight, and if direct "Grex" units were being used, a specific change in yarn number would mean the same change in fabric weight for all fibers and at any point of the yarn number scale.

The adoption of any universal numbering system for all yarns would simplify all calculations involving the substitution of fibers for which strength is commonly expressed in different units.

### Endorsements by the Industry

In order to secure as wide a distribution of the proposal as possible, this manuscript has been submitted for publication in TEXTILE RESEARCH, *Cotton, Rayon Textile Monthly,* and *Textile World,* inviting comments from the industry. Prior to publication it has only been possible to secure opinions from officers, subcommittee chairmen, and a few of the members of A. S. T. M. Many of the members who have been interviewed were in favor of the proposal.

For example: a preliminary survey of the Committee on Cotton Yarns indicated that in general, mills who at one time or another handled rayon, were in favor of the universal numbering system, but those who had confined their activities exclusively to cotton, were less favorable to the plan.

The following extracts are from a few of the letters which have been received by the committee endorsing the system:

WILLIAM D. APPEL, U. S. Bureau of Standards, chairman, A. S. T. M. Methods Committee: "I believe the A. S. T. M. should sponsor this proposal. It seems to me that this is the long-delayed answer to a fundamental difficulty in the textile industry."

MARTIN CASTRICUM, U. S. Rubber Co., chairman, A. S. T. M. Tire Cord Committee: "The idea appeals to me a great deal, and I would be glad to support it if the consensus is such that some hope of universal adoption could be realized. You can count me in on a move in this direction."

O. G. EDWARDS, Avondale Mills, chairman, A. S. T. M. Cotton Yarn Committee: "I have read, studied, and discussed your proposal with the management and also with the different superintendents throughout our organization, in order to get well rounded opinion. As a general rule, I don't find too much objection. As for me, personally, I would like to see such a system as this put into effect, and I am of the opinion that if D–13 should sponsor such a program, in a few years it would become universal."

R. W. VOSE, director of research, Chicopee Manufacturing Corp.: "The staff of the Research Division is entirely sold on the proposition."

W. L. FOOTE, B. F. Perkins & Son, Inc.: "Not content with my own feelings on this subject, I laid the matter before some textile men, who might be too modest to say they are experts. Everyone has spoken in favor of "Grex" and have wondered why something had not been done before. It would seem that the "Grex" suggestion is worthy of some encouragement by Subcommittee B–2."

In view of the fact that the proposal will come up for action at the March meeting of Committee D–13 the Subcommittee desires an early expression of opinion from the industry and requests that letters be addressed to A. G. Scroggie, chairman, Subcommittee B–2, c/o E. I. du Pont de Nemours & Co., Inc., Box 1477, Richmond 12, Va.

# RESEARCH ACTIVITIES

THE ANNUAL MEETING of the Inter-Society Color Council is to be held at Hotel Pennsylvania, New York, March 1, commencing 9:30 a.m. The morning session will be under the chairmanship of Deane B. Judd, and is co-sponsored by the American Association of Textile Chemists and Colorists and by the Federation of Paint and Varnish Production Clubs. Speakers and topics scheduled are: "Why Small Color Differences are Important," (A) in textiles, E. I. Stearns and F. T. Simon, (B) in paints, Francis Schofield and S. E. Beck; "Summary of Available Information on Small Difference Formulas," Dorothy Nickerson; "How Color Tolerances are Met in Industries Represented by I. S. C. C. Member Bodies," by representatives of the various member associations; "Summary," with special attention drawn to type of information still needed, Deane B. Judd. At 2:30 a discussion session will be held. Any one connected with the textile industry will be welcome at the meeting.

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THE OPTICAL SOCIETY OF AMERICA will hold meetings at Hotel Pennsylvania March 2–4. On the afternoon of March 2, the Optical Society will hold a symposium of invited papers on the Ostwald Color System to which all I. S. C. C. members are invited. There will be four papers: (1) by Zeishold; (2) by Foss, Nickerson, and Granville; (3) by Granville and Jacobson; and (4) by Birren. Undoubtedly there will also be contributed research papers on color at the Optical Society meetings that will interest I. S. C. C. members. Non-members of the O. S. A. who wish to have copies of the program should write the O. S. A. secretary, Professor A. C. Hardy, Massachusetts Institute of Technology, Cambridge 39, Mass.

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THE SPRING MEETING of Committee D–13, American Society for Testing Materials, will be held March 8–10, at the Park-Central Hotel, New York City. Details regarding sessions can be obtained from R. H. Brown, Parks-Cramer Company, Fitchburg, Mass.

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A NEW PLASTIC with possible applications as a coating for fabrics has been announced by Du Pont. It is said to have superior properties of flexibility and toughness over a wide range of temperatures, resistance to water and moisture penetration, chemical inertness, and electrical properties.

★

REMOVAL of the waxy constituent of cotton linters by a controlled bacterial treatment is the purpose of a process patented by the Chemical Foundation. It is stated that its use in the production of rayon results in a product of improved dyeing qualities. The research work on this process was conducted at the Foundation's Laboratory in the Boyce Thompson Institute For Plant Research in Yonkers, N. Y

★

A NEW MICROSCOPE which converts an ultraviolet image to a picture in full colors has been invented by Russian scientists and is reported in *Science*

*News Letter* for Dec. 4, 1943. The colors of the image correspond and are the index to the different wave-lengths of the ultraviolet light used to illuminate the object. The image is thus shifted from the ultraviolet to the visible.

★

RHODE ISLAND School of Design Textile School has just received $50,000 from Atlantic Rayon Corp. to establish two annual Textron fellowships of approximately $1,200 each, William D. Fales, head of the school, announces. The award is to be given each year to two senior students, either men or women, one of whom may have completed the bachelor of science course in textile engineering and the other the bachelor of fine arts course in textile design. Based on a thesis covering some phase of the rayon industry, scholastic ability, and executive qualifications, the award will entitle the recipients to a year's training in industrial establishments and to approximately $1,200 during that time.

★

A CONSTRUCTIVE CRITICISM and discussion of the Kilgore bill which proposes to set up an Office of Scientific and Technical Mobilization appears in *Science* for December 31, 1943. The article is a reprint of a letter to the Honorable H. M. Kilgore, written by Dr. Vannevar Bush, Director of the Office of Scientific Research and Development.

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BASIC FACTS about rayon, for retail stores sales personnel and for purchasers and users of rayon fabrics and merchandise, are contained in "Your Guide to Rayon," a booklet recently issued by the American Viscose Corporation.

SOYBEAN FIBER production has been started at the Cincinnati, Ohio, plant of the Drackett Co. This concern currently produces about 70,000 tons of soybean meal annually, and 30,000,000 pounds of soybean oil.

★

DU PONT announces the perfection of an ultraviolet photometer which detects the presence of gases and vapors in the atmosphere of manufacturing plants. It was developed particularly to provide protection against fumes of carbon disulfide, a solvent used in the manufacture of viscose process rayon yarns. The new instrument is said to be able to detect a concentration as low as one part of carbon disulfide in one million parts of air.

★

THE FUNCTIONS of a mill laboratory as illustrated by the methods employed in operating Pepperell's laboratory are described in a pamphlet entitled "Function of a Testing Laboratory in a Textile Mill," issued by the Pepperell Mfg. Co.

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CONTINUOUS BLEACHING of cotton goods in the open width is the most recent step in this type of textile processing. The new process, developed by the Electrochemicals Department of E. I. du Pont de Nemours & Company, shows savings, as compared to older methods, particularly in chemical and steam requirements. It also has the advantage of being continuous from grey storage to dry cans, eliminates the bleach house delays of batch processes and permits adequate sample control. The new method is in operation at the Riverside and Dan River Cotton Mills, Inc., Danville, Va.

**The Value of Applied Research in Textile Schools is Demonstrated by Results of Research Program at**

# The Philadelphia Textile Institute

**By H. WICKLIFFE ROSE***

*One of the agencies through which research can be channeled to the industry is the textile school. Recognizing that fact, the Textile Research Institute, Inc., keeps in touch with the programs of the various schools. In recent months, several of them have expanded their plans. We hope to supply from time to time, in these columns, information on those plans. We start the ball rolling with this article about the Philadelphia Textile Institute, the oldest textile school in the country.*

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One of our textile friends recently said that there was too much research, that a mill man could spend more time testing than producing, and that much of it was a waste. We were discussing research in textile schools, and this perfectly friendly discussion had the stimulating effect of making it clear, to me at least, that research has two valuable results, knowledge and education.

Whether or not our friend is convinced yet of the dual nature of research, it has been recognized for many years. As the college has grown out of the institutions for the education of students of divinity in the past several centuries, so has industrial research grown out of the education of students of science in the past thirty years.

Whether knowledge or education came first is of interest only as a sophistic argument. The fact is, one is so dependent on the other, and they revolve so rapidly in such a small orbit, and are attracted by such a strong bond, that we are inclined to consider them as one, as we do the atom. Only when one becomes disassociated from the other by the breaking of that strong bond does it wander aimlessly and become static.

So is research the electron to the nucleus of knowledge bound by the active force of education. Only when it wanders off and becomes static does it seem to defy that force; but it is the same force on the static charge, which, when it accumulates, brings it back from its wanderings in a flash of light.

The origin of industrial research at the University of Kansas in 1907 was as natural as is the proposal of the Textile Research Institute to complete the cycle by connecting with an educational institution. The Mellon Institute at the University of Pittsburgh, the Purdue Research Foundation at Purdue, and Arthur D. Little, Inc., and its connection with M. I. T., all are in recognition of the inevitable connection between research and education. In the Institute of Paper Chemistry it is difficult to distinguish between the two purposes, knowledge and education.

While it is admitted that there is some waste in research, it is not because of the mere duplication of projects and effort in various places. At least for one of these two main purposes behind research, it is no more

* Coordinator of Research Planning, American Viscose Corporation. Member of Board of Governors, Philadelphia Textile Institute.

Fig. 1. Jacquard card punching from designs. This illustrates the application of art to industry at the Philadelphia Textile Institute.

wasteful to have the same research project in a number of different institutions than it is to have the same course, such as English for example, in every curriculum of different colleges. Research is truly wasteful when it neither is educational nor results in knowledge. The Kilgore Bill for Technical Mobilization misses this point. With its objective of a planned technical economy it ignores not only the value but the necessity of the educational feature of research and would remove the incentive to private industrial research by having the results belong to the public. It is well established but not clearly recognized that competition between private enterprises leads to research in volume and variety, while the socialization of enterprise, industry, or research leads to complacency.

Mark Van Doren, in "Liberal Education," a recent book and one of the best on education written since the last war, points out that there are the natural arts and the human arts. Among the latter he reminds us further that the liberal arts occupy a position between the useful and the fine arts, with a strong bond and interrelation with both. Vocational and technical schools and colleges concentrate on perfection in the useful and the fine arts, while a college giving the Degree of B.A. should concentrate on the liberal arts, which Mr. Van Doren simplifies in broad generalization as language and mathematics. Obviously the liberal arts are employed in the practice of technical education, but to master them and truly to earn the degree of a master is another question. Because of that fact, however, it is the more important to be aware of all the arts and their relation in order to avoid the slighting of some for the sake of seeking a living by means of others. Where the last war brought out that our youth had been underfed, this war revealed that they had been undernourished in the liberal arts, and that thousands of high schools had ceased to require mathematics, for example. The War itself is now correcting that deficiency by concentrating on mathematics and sciences, but it is over-correcting by causing the omission of fine arts in most men's colleges and in many schools.

The ideal organization for technical education is to have the industrial arts and the fine arts connected with it. Since the technical school or college recognizes that the student either has completed his formal college education

in liberal arts or is unable to pursue it, the combination of the two remaining arts is broadening, and affords application and extension of some liberal arts.

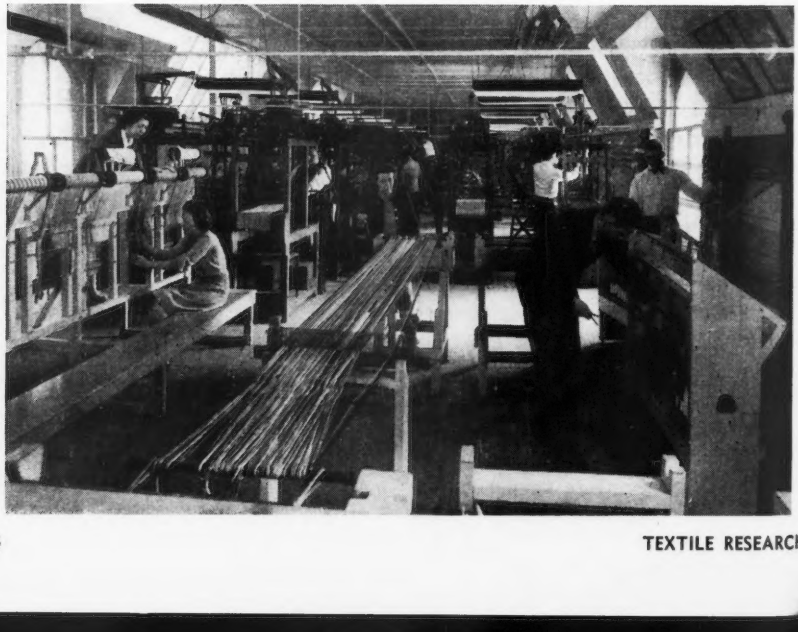
The Philadelphia Textile Institute is part of such an organization, in which the School of Industrial Art is another part of the corporation of the Philadelphia Museum of Art. The museum itself affords visual example and inspiration for the students in the industrial art and textile schools. Between these three divisions of art in the corporation, man's entire visible environment can be made harmonious, colorful, and enjoyable, but most important of all, man is made better able to enjoy it.

Of the three, textiles predominate, for we live constantly and always in, on, and with a great variety of fabrics. We are so constantly with fabrics that we take them fairly for granted, although there is more fabric consciousness today than there was at the beginning of the century. Most of us can remember when, in the average household, the table was set with a white cloth, the beds were covered with white counterpanes, and the windows usually had white curtains. We can recall the introduction of color into the household after the last war and the almost revolutionary effect it has had in the textile industry, as well as in the trade and in the dressing and furnishing habits of the household.

### Research for Industry Program

The increasing complexities in textiles, brought about by the rise of color and the dyestuff industry, the introduction of man-made fibers with their many potentialities, and the development of new machinery and techniques, together with the sudden demands of new problems brought on by the war, led the Philadelphia Textile Institute to begin research for industry. Only about a year ago, while M. Earl Heard

**Fig. 2. Hand-weaving room at the Philadelphia Textile Institute. All students make their own fabric by hand before they are introduced to the machine operations. This is an application of art to industry. In the foreground—making up of colored warps by hand.**



was still dean, the program was begun, and it is being continued by dean Richard Cox. The former dean was a textile man with a research mind and an appreciation of art and its place in textiles. The present dean is a graduate of the School of Industrial Art, a competent designer, and with years of textile experience. In this succession we find a natural blending of art, education, and research, which are essentially inseparable.

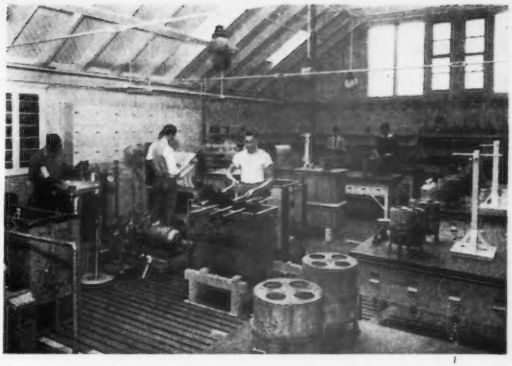


Fig. 3. Dye house at Philadelphia Textile Institute.

Being a technical institution for studying the useful arts, the research work of the Philadelphia Textile Institute is applied rather than fundamental. This work is in contrast to that of Dr. Milton Harris and his staff, which has been specific only in subject but fundamental in character. Industrial problems are brought to the Institute by manufacturers, mills, factors in the trade, and by the Government. In all cases the donor of the project seeks to extend and supplement his own facilities and knowledge by using those of the school and its faculty. In that way the school becomes a pilot plant for some projects, a centralized focal point for gathering information from any and all sources and bringing it to bear on the problem. Some of the donors are not textile firms, and so turn to the school for guidance and information on specific problems involving textiles; others have no available equipment for making certain investigations, while still others seek mere verification of their own findings.

The research projects are arranged through the dean, who determines whether and when the work can be undertaken. Since it is difficult to estimate the exact cost of a project, the contract usually provides for periodic payments for a definite time. Usually the project is completed within the specified time; but if it is not, or if, as is sometimes the case, other promising subjects of research arise from the work, renewal or extension of the contract is considered.

The research work referred to so far is conducted by the faculty in its spare time. If appropriate, students might assist, and in some exceptional cases a project becomes part of the work of an entire class. Work done under student scholarships is usually within the regular curriculum, but fellowships might be occupied by either students or instructors, and the work might be general or specific.

### Type of Projects

In view of the fact that the program of research for industry is only a year old, many of the projects are current. The work is conducted in confidence unless, or until, the donor advises otherwise, and specific information of the current work cannot be published. The interesting point, however, is the variety of the problems and the versatility of the Institute in helping to solve them. At the present time about

a dozen projects are in work, and half that many are being scheduled or are under consideration.

Most of the donors are nationally known textile concerns such as Cluett Peabody, while many are smaller concerns or mills with no research facilities of their own. One is a large manufacturer of electrical equipment, another manufactures buttons, and a third is a laundry service. They include manufacturers of dyestuffs, plastics and coating materials, and synthetic fibers, as well as prospective growers and users of natural fibers. An interesting project is just being undertaken by contract with WPB through the Office of Production Research and Development. One factor in the trade wanted the Institute to make up its samples, and while routine work of the kind could not be accepted without interfering with the regular class work, it is understood that the Institute is interested in the development of any new fabric ideas.

Some subjects of research are undertaken by the Institute without sponsorship in the course of its regular work. The "Grex" system of yarns standardization can affect all textile systems. A frequent industrial research project is the running of a new type of fiber on all systems to develop a satisfactory technique for producing a yarn with the fiber. The comparative results are confusing if each yarn is recorded on a different system, while a uniform system makes results immediately comparable. In order to prevent confusion in the class, where "Grex" is used the older system is also recorded, and a student maintains an understanding of the older systems while appraising the new system and the new product. Any reform, no matter how good or advisable, can become established most surely through the rising generation, and textile schools are the best media for bringing about a reform of this type.

In addition to the Government project mentioned above, one on the use of reclaimed wool has just been completed, which will be of use in Lend-Lease. A broad survey on woolens has been under discussion with the Philadelphia Quartermaster Depot and with the Textile Research Institute. Such a survey on worsteds was completed by the Philadelphia Textile Institute and was commented upon favorably by Colonel Steadman at a meeting of the Textile Research Institute.

Previous recognition by the Textile Research Institute of the value of applied research in textile schools was demonstrated in the warp sizing project. That study was started in industry and was completed at North Carolina State. With a broad view of the facilities, faculties, policies, and programs of the various textile schools, the Textile Research Institute is in position to place, guide and centralize textile research of wide interest.

It remains, meanwhile, for industry to bear in mind the dual objectives of research—knowledge and education. In turning to a textile school for specific information, a mill can at the same time assist in the training of new students for the betterment of the textile industry. Frequently a student working on a specific project goes to work for the industrial donor of the project. While the donor is gaining from the specific information developed, he and the industry gain from the training of men and women, and, in due course, mankind gains by the material results and by the additions to the fund of human knowledge.

# RESEARCH AIDS

## Post-War Opportunities In Industry*

What opportunities will there be in your business after the war? This question was put to a group of well-informed leaders representing 150 important industries, and their opinions are summarized in the book "The Return of Opportunity." Emphasis is placed upon new vocational opportunity, new products and processes, and new ways of making familiar products better.

Of particular interest to the textile industry are two chapters, one on cotton and one on synthetic materials. The former was written by Walter L. Randolph, president of the Alabama Farm Bureau Federation, and is entitled "Two Shirts, a Dress, or Four Playsuits," referring to the suggestion that if just one pound could be added to the world's per capita demand for cotton—two shirts for each man, one dress for each woman, four playsuits for each child—the average surplus of production over consumption during the five-year period preceding the war could be wiped out and orders for 2,800,000 bales would be left unfilled.

The article on synthetics, entitled "Making Textiles Out of What Have You," was written by John F. Hagen, past-president of the American Association of Textile Technologists, who states that the spectacular progress of synthetic fibers indicates that in the textile field post-war possibilities for new enterprise and new careers will be very great.

Reference to textile applications, post-war, is made also in chapters on fiber-glass, rubber, home equipment, and others.

* THE RETURN OF OPPORTUNITY. Edited by William R. Kuhns. *Harper & Bros., New York. Price, $3.00.*

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## Role of Testing Laboratories in The Post-War World*

Much has been written about the part chemists, scientists, physicists, and testing laboratories will play in the post-war world. Manufacturers throughout the country are thinking ahead, planning on the use of research and testing in the solution of their problems. How best to put to use the vast knowledge stored in the minds and files of research and testing engineers causes manufacturers to ask—"What can the Testing Laboratory do for us?"

A booklet recently issued by the U. S. Testing Co. furnishes a brief over-all answer to the question—"What can science do for us?" Attractively illustrated, it describes the organization and research facilities of the Company in varied fields such as the engineering and refrigeration fields; and the aircraft, chemistry, shoe and textile industries.

* A NEW WORLD. *U. S. Testing Co., Hoboken, N. J. 24 pp. Free upon request.*

★

## Post-War Plans of The United Nations*

A factual and objective survey of proposals and programs for reconstruction within the various United Nations

* POST-WAR PLANS OF THE UNITED NATIONS. Lewis L. Lorwin. *The Twentieth Century Fund, 330 West 42nd Street, New York. Price, $2.50.*

has been made by Lewis L. Lorwin for the Twentieth Century Fund. Separate sections deal with the United States, Great Britain, the Soviet Union, China, Canada, Australia, Latin America, Governments-in-Exile, India, New Zealand and others.

The plans of the leading Government agencies, labor organizations, business and social welfare groups in each nation for domestic improvement when the war is over are summarized.

The survey finds that "the countries of the United Nations fall into three broad groups. The first group includes the United States, Great Britain, Canada, Australia, and some countries of western Europe. Most official and unofficial plans of these countries assume that private enterprise will remain the dominant form of economic activity.

"The second group includes some countries in central Europe, a number of Latin American countries, and China. The plans of these countries assign a large and permanent place to state enterprise and to other forms of collective organization, e.g., industrial co-operatives, in the tasks of reconstruction and post-war development.

"The third group consists of the Union of Soviet Socialist Republics with its complete nationalization of economic life and centralized planning methods."

Certain common aims emerge, such as full employment and emphasis upon improvement of the economic and social conditions of the mass of the people.

Irrespective of an individual's private views on the value of such planning, and the direction it should take, he needs to be informed regarding proposals now in the making. Dr. Lorwin supplies this information.

## A. S. T. M. Year Book

The Year Book for 1943 published by the American Society for Testing Materials has been recently published by the Society from its headquarters at 260 S. Broad St., Philadelphia, Pa. Contained therein is general information about the organization and its by-laws, and regulations governing the standing committees. A list is given of its members with their business connections, also a complete listing of the personnel of the various standing committees. It is stated that the membership list is not to be used for circulation purposes not connected with the activities of the Society.

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## pH and Chlorine Control

The completely revised 83 page combination handbook and catalog (6th edition) "Modern pH and Chlorine Control," has been issued by W. A. Taylor & Co., 7300 York Road, Baltimore 4, Md. Fifty pages are devoted to (1) a simple, non-technical explanation of the meaning of pH control and the methods for making colorimetric determinations; (2) precautions to be observed; (3) discussion of the application of pH and chlorine control to 31 different fields, including textiles, water purification and softening, boiler water, etc. (4) a technical discussion of the meaning of pH control. These four sections bring together, in condensed form, information which cannot be obtained elsewhere except by reference to innumerable textbooks and original articles. The remaining 33 pages contain descriptions of Taylor Slide Comparators for general pH and chlorine control, determination of phosphates in boiler water for prevention

of corrosion and scale formation, and for analysis of water for iron, silica, color, manganese, etc. A copy will be sent free on request.

★

## Technical Advisory Service

A Government service with trained personnel to serve small industries as a clearing house for problems that may arise within any field of industry has been established.

It is announced that the Technical Advisory Service is made available through the cooperation of many of the industrial and commercial research laboratories and scientists of colleges and technical schools, as well as Government research bureaus. Competent counsel in engineering will be contacted when the problem so demands. Professional services of consultants are available at standard fees when the problems require study or observation on the job. Other than these the service is free.

For information, write to Orville T. Colby, Regional Consultant, Technical Advisory Service, Smaller War Plants Corporation, 1612 Market Street, Philadelphia, Pa.

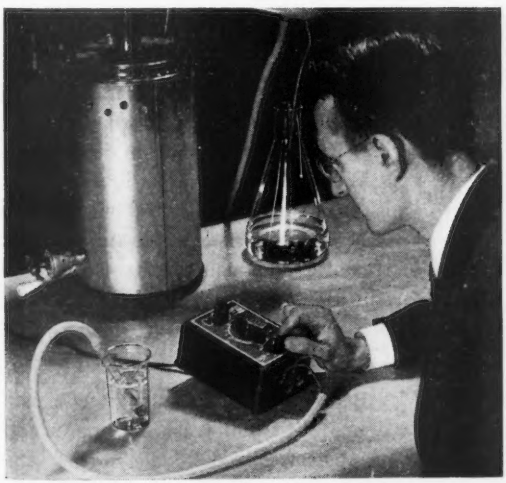
★

## The Barnstead Purity Meter*

Precise analyses of the water provided by modern laboratory stills hitherto have been required. The new measuring instrument greatly simplifies the procedure and saves analysis time. It is stated that tests of distilled water require only a minute.

The meter reads directly in parts per million of sodium chloride. The impurities—regardless of their nature—are expressed as "sodium chloride" because the analyst is interested, at this point, merely in the degree of purity, and not in the actual analysis.

The new instrument indicates the purity of distilled water by measuring its electrical conductivity. Since conductivity depends on ionization and most impurities in distilled water are ionized, the instrument reading is an indication of water purity or degree of impurity.



**Tests of distilled water with the Barnstead Purity Meter require only a minute; impurities are read directly in parts per million.**

*Barnstead Purity Meter. *Fisher Scientific Co., 717 Forbes Street, Pittsburgh, Pa., and Eimer & Amend, 633 Greenwich Street, New York, N. Y.*

**Effective Means for Analysis of Trash in Cotton Lint is Provided by**

# The Shirley Analyzer

**By GEORGE W. PFEIFFENBERGER***

The problem of waste in cotton, its removal in the manufacturing processes, and its effect on cost and quality of cotton textiles is so well known in the industry that no discussion is required here. The very importance of this subject, however, stamps it as one worthy of extensive research. Such investigations, however, have been hampered somewhat by lack of equipment for separating lint from trash. Cotton mill cleaning equipment not only removes foreign matter but also considerable fiber.

The Shirley Analyzer, a laboratory machine developed at the Shirley Institute, Manchester, England, provides an effective means for both quantitative and qualitative analyses of foreign matter in cotton lint. This machine is quite unique in both operation and results. Whereas present opening and cleaning equipment in cotton mills affords considerable cleaning effect, an appreciable amount of trash still remains in the lint, and considerable usable fiber is thrown out with the waste. The machine developed at the Shirley Institute separates the trash from the lint with a minimum of fiber loss. This is probably the nearest approach to perfect separation of lint and foreign matter that has yet been developed.

* Cotton Technologist, Research and Testing Divisions, Cotton and Fiber Branch, Food Distribution Administration, U. S. Department of Agriculture.

## Description of Machine

A general view of the machine is shown in Fig. 1. As may be seen in this illustration and in Fig. 2, the machine is relatively simple. It consists of a feed table, feed roll, lickerin, baffles, air blast, and condenser. The lickerin is very similar to that used on commercial cotton cards. The cotton is fed slowly to the lickerin and, as it is broken up, the air blast carries the lint around the bottom of the flow plate and up to the condenser. Trash and heavy particles drop into the waste chamber. The machine is so constructed that not only raw cotton but also various waste products can be analyzed. Fig. 3 shows samples of the raw stock and the resulting products. The clean lint, as shown, is deposited in the lint chamber and the motes and trash in the waste chamber. The motes and trash are not separated by the machine. They are shown separately in Fig. 3 for purposes of illustration.

While the machine as it now stands is purely a laboratory device and its only function is to separate lint from trash in small samples, its use and possibilities are numerous.

## Relation of Waste to Grade

Because of the almost perfect separation of lint and trash, the percentage of waste removed by the Shirley Ana-

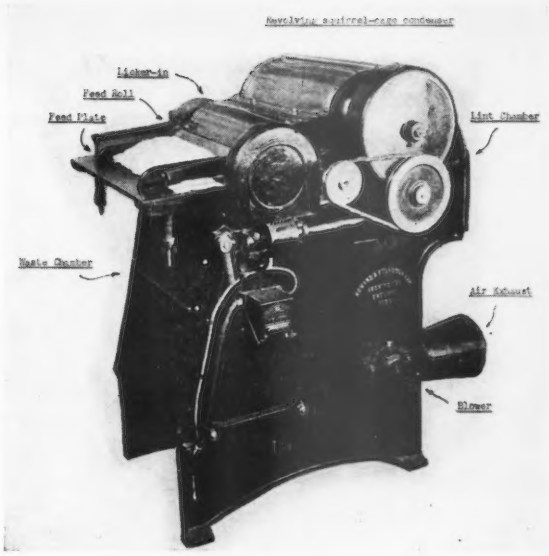
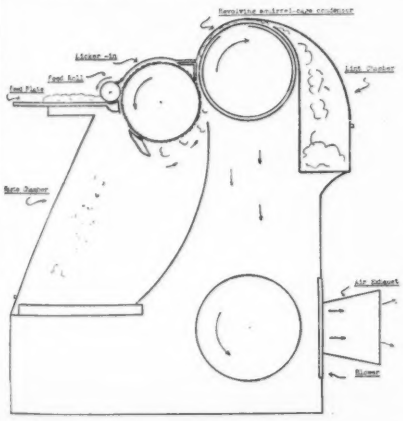



**Fig. 1. The Shirley Analyzer. Designed for both quantitative and qualitative analysis of foreign matter in cotton lint.**

lyzer is less than that removed by regular mill machinery because waste from the latter includes a considerable amount of fiber. There is, however, a good correlation between Shirley Analyzer waste percentages and combined picker and card waste. Because of this relationship, it is possible to obtain rapid determinations of waste content that may be expected in the mill from the same cottons. Generally speaking, waste is definitely related to grade as the two terms are normally used in commercial practice. On an individual bale or sample basis, however, there is frequently a considerable discrepancy between grade and waste. An examination of the waste removed by the Shirley Analyzer may serve to explain this seeming discrepancy. The type of waste as well as the quantity must be considered in any critical study of waste in relation to grade. Some types of waste are relatively heavy but are not easily seen in the raw stock. Examples of these are motes, light-colored sand, and dust. On the other hand, dried dark-colored leaf, which is readily discernible in the lint, may not have much weight. It is, therefore, not unusual to find some bales of high grade cotton with greater waste loss in the manufacturing processes than other bales of lower grade.

**Fig. 2. Diagram of Shirley Analyzer. Illustrates method of operation.**




## Analysis of Grade Factors

Grade is composed of three factors, color, leaf, and preparation. Since preparation is largely a matter of con-

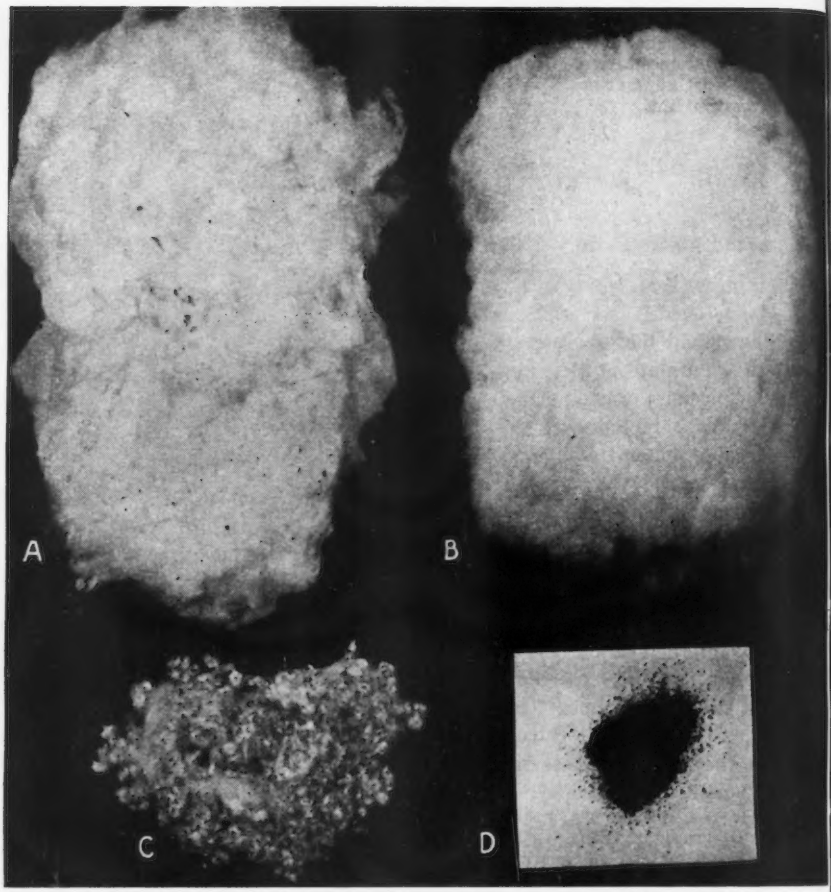



**Fig. 3. Shirley Analyzer products: (A) raw stock; (B) cleaned lint; (C) motes and heavy trash removed from raw stock; (D) leaf and dirt removed from raw stock.**

dition of seed cotton and ginning efficiency, it does not enter into the waste problem on a weight basis to any great extent. It is not improbable that in some instances the presence of considerable amounts of leaf may lead to a false impression of color, since the eye may not be able to distinguish between actual color of the lint and the composite impression gained by the presence of foreign matter. The Shirley Analyzer can be of use in the study of grade by removing all of the trash and thereby permitting the observation of the color of the clean lint. In those cases where grade is low, simply because of trash, it is frequently difficult to distinguish between different grades after the samples have been passed through the machine. This, therefore, may afford a method of breaking down grade into its component parts. For example, if two samples, one graded as Strict Middling and one as Middling,

TABLE I. Percentage of clean lint recovered by the Shirley Analyzer from samples of raw cotton and specified types of processed material and waste

| Sample number | Raw stock | Finisher lap | Finisher motes | Card motes | Flat strips | Cylinder and doffer strips |
|---|---|---|---|---|---|---|
| | *Percent* | *Percent* | *Percent* | *Percent* | *Percent* | *Percent* |
| 1 | 96.5 | 98.2 | 45.2 | 59.9 | 88.6 | 96.0 |
| 2 | 97.4 | 98.6 | 44.4 | 53.1 | 90.0 | 96.5 |
| 3 | 96.3 | 98.0 | 44.6 | 54.0 | 87.9 | 95.7 |
| Average | 96.7 | 98.3 | 44.7 | 55.7 | 88.8 | 96.1 |

TABLE II. Fibrograph upper half mean fiber length of raw cotton and specified types of processed material and waste after processing through Shirley Analyzer

| Sample number | Raw stock | Finisher lap | Finisher motes | Card motes | Flat strips | Cylinder and doffer strips |
|---|---|---|---|---|---|---|
| | *Inches* | *Inches* | *Inches* | *Inches* | *Inches* | *Inches* |
| 1 | 0.93 | 0.97 | 0.95 | 0.54 | 0.92 | 0.94 |
| 2 | .98 | .99 | .98 | .55 | .95 | .95 |
| 3 | .97 | .96 | .92 | .62 | .91 | .92 |
| Average | .96 | .97 | .95 | .57 | .93 | .94 |

are passed through the machine, an examination of the weight and type of trash removed and a comparison of the clean lint may show the real reason for the lower grade. If the two samples of cleaned lint are difficult to distinguish from each other, the difference in grade designation can be attributed to the factors of grade other than color. On the other hand, if there is still a considerable difference in their appearance, fiber deterioration as reflected by color is indicated.

### Analysis of Mill Wastes

A third use of the Shirley Analyzer, and one which would apply directly to mill problems, is the analysis of waste products such as picker motes, flat strips, etc. Since the machine is able to handle various types of mill waste, it is possible to use it in determining the efficiency of the various cleaning operations. Examples of this are shown in Table I and illustrated in Fig. 4. Samples of raw stock, finisher picker lap, and four picker and card waste products were processed through the Shirley Analyzer. The average waste removed from the raw stock was 3.3 per cent, and the waste removed from the finisher lap was 1.7 per cent. This is an indication that the two processes of picking removed approximately only 50 per cent of the trash originally in the cotton. In the case of the finisher motes, 45 per cent of the motes were composed of good fiber. Proceeding through the manufacturing processes, it is important to note that in the card motes, there was 56 per cent of good fiber; in the flat strips, 89 per cent; and in the cylinder and doffer strips, 96 per cent. This indicates that a large part of the material now considered as waste is composed of good usable fiber. This statement is substantiated by the fibrograph length

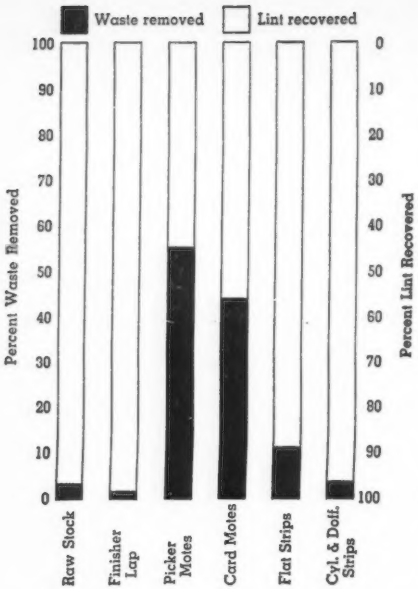



**Fig. 4. Waste removed and lint recovered by Shirley Analyzer from a number of different types of samples.**

tests on the fiber thus reclaimed from the waste products. These data are presented in Table 2. As shown in the table, the upper half mean of the raw stock was 0.96 inches. The fibrograph readings for the four different waste products show a significant shortening of the staple in only one of them, namely, the card motes. The finisher motes, flat strips, and the cylinder and doffer strips have approximately the same staple length as the raw stock. Therefore, a considerable amount of good fiber is evidently lost in the cleaning and carding processes.

Fibrograph or array measurements used in conjunction with the Shirley Analyzer would be useful for determining proper settings on pickers, cards, combers, etc. Samples could be drawn from the various waste products and run through the Shirley Analyzer to determine the proportions of actual trash and good lint and settings could be changed accordingly. Without a machine for separating actual trash from the lint, it is very difficult to obtain a representative sample of waste products for fibrograph or array purposes.

## Commercial Cleaning

The use of the Shirley Analyzer in such problems suggests the idea of employing the same principle in commercial cleaning of cotton either at the gin or in the opening process at the cotton mill. If cleaning such as this could be performed at the gin, a considerable saving would be effected in shipping costs. Such prior cleaning would also relieve the card of a heavy cleaning burden and would increase the life of the card clothing by reducing the frequency of the grinding operation. The principle might be carried out further in the reclaiming of usable fiber from the various waste products.

The possibility of using this principle in commercial practice gives rise to the question as to whether the processing through this machine might cause fiber damage. The data available to date are too limited to justify any definite conclusions with respect to this question. It appears reasonable to assume, however, that there should be no more damage than would normally occur in the card, which has a similar lickerin.

Considerable laboratory and engineering research is still needed to adopt the Shirley Analyzer principle to practical commercial use. The above suggested possibilities, however, may serve to stimulate interest in this important problem of waste removal and fiber reclamation.

# ABSTRACTS

*Members of Textile Research Institute, Inc., desiring complete copies of articles abstracted may obtained photostat copies at cost by addressing the Institute's office, 10 East 40 St., New York 16, N. Y. The price of a photostat negative is seldom more than 50 cents per page of original text.*

NOTE: *Through an oversight the American Cotton and Wool Reporter was omitted from the list of periodicals on page 32 of the January issue.*

## ANALYSIS: TESTING LABORATORY METHODS

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### Indicators

**Methylene blue and other indicators in general acids: the acidity function.** G. N. Lewis and J. Bigeleisen. *J. Amer. Chem. Soc.* **65**, 1144–50.

Acid additions to methylene blue are interpreted in terms of Lewis and Calvin's rule. Sulfuric acid, boron trichloride and stannic chloride are used as acids. Another class of dyes, phenolphthalein, eosin, and dinitrodibromofluorscein, and indicators in the range from 95 percent to fuming sulfuric acid. They illustrate further the difference between acid addition at the central and at the end positions. It is shown that in the more concentrated acids used by Hammett and Deyrup a large part of the color change results from the addition not of $H^+$ but of another acid, namely, sulfur trioxide. In the range of the author's titrations and presumably all the way to pure $SO_3$, the acidity function ($H_0$) measure not log $a_{H^+}$ but log $a_{SO_3}$.

### Metacresolsulfonphthalein

**Basic ionization constant of metacresolsulfonphthalein; pH values and salt effects.** Elizabeth E. Sager, Harry J. Keegan and S. F. Acree. *J. Research Natl. Standards* **31**, 323–43 (Dec. 1943).

Spectral transmittancy values at room temperatures approximating 25° C. were obtained for $1.25 \times 10^{-5}$ M metacresolsulfonphthalein in water and in 0.001 — to 8 M hydrochlorie acid. In water the indicator exists in the yellow form (Y), and hydrogen ions (H) from acids convert it into the red form (R). The molar concentrations of each form of the indicator in various concentrations of hydrochlorie acid were computed from the spectrophotometric data. The dissociation constant (K) for the reaction of the indicator with hydrochlorie acid is given by the equation.

$$K_b = M_H f_H M_y f_y / M_R f_R,$$

in which M and f, with appropriate subscripts, represent the molarities and activity coefficients respectively. The value of $K_b$ is $1.98 \times 10^{-2}$ and that of $-\log K_b$ or $pK_2$ is $1.703 \pm 0.005$. The indicator is useful over the pH range 0 to 3.

### pH of Alkaline Solutions

**Properties of detergent solutions. Thermal pH co-efficients of alkaline solutions.** Lester E. Kuentzel, James W. Hensley, and Leslie R. Bacon, *Ind. Eng. Chem.* **65**, 1286–89 (Dec. 1943).

Reports the pH values for distilled water solutions of sodium hydroxide, sodium orthosilicate, sodium sequisilicate, sodium metasilicate, trisodium phosphate, tetrasodium pyrophosphate, sodium carbonate, and sodium bicarbonate in concentrations of 1%, 0.1%, and 0.01%, and at 25° C, 40° C, and 60° C. Plotting pH vs. temperature a straight line is obtained. The pH values may be calculated from $pH_{t_2} = pH_{t_1} + A\ (t_2 - t_1)$ where $A = \Delta pH/\Delta T$. Both glass and hydrogen electrodes were used. In solutions of high pH at high temperature the sodium error with the glass electrode was considerable. The effect of increased temperature is generally to lower the pH slightly in alkaline solutions.

## CHEMICAL AND PHYSICAL RESEARCH

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### Acetylation of Cellulose

**The acetylation of cellulose.** L. Clément and C. Rivière. *Bull. Soc. Chim. de France* **9**(5) 494–511 (Mar.–Apr. 1942) (Through *Kodak Abst. Bull.* Sept. 1943).

A study was made of the effect of various factors in the acetylation of cellulose, including (1) the total concentration of sulfuric acid, (2) the ratio of sulfuric acid to cellulose (3) the time of pretreatment, (4) the ratio of acetic anhydride to cellulose, and (5) the concentration of cellulose. The speed of hydrolysis to acetone solubility was a linear function of the total sulfuric acid concentration. The speed of hydrolysis was not affected by varying the ratio of sulfuric acid to cellulose. The longer the time of pretreatment, the lower the viscosity of the cellulose acetate obtained. The degree of acetylation increased with increase in the ratio of acetic anhydride to cellulose. Under certain conditions of sulfuric acid concentration the degree of acetylation increased with the concentration of cellulose.

## Effect of Acid on Cellulose

**The rate of change in the properties of cotton cellulose under the prolonged action of acids.** G. F. Davidson. *J. Text. Inst.* 34, T87–96 (Oct. 1943).

When cotton cellulose is treated with hydrochloric or sulfuric acid under conditions that do not lead to its dissolution, there is initially a progressive change in the properties of the resulting hydrocelluloses, but ultimately a stage is reached when little further change in properties occurs; at this stage only a small proportion of the glycosidic linkages in the cellulose have been hydrolysed. Measurements of the loss of weight suffered by the cellulose show, however, that hydrolysis does not cease when the properties of the hydrocelluloses become constant, but proceeds very slowly. These observations, and the marked contrast between the hydrolysis of cellulose in homogeneous and heterogeneous systems, are explained in terms of differences in the accessibility of glycosidic linkages to the acid, resulting from the partly crystalline, partly amorphous, structure of the fibre. Mercerized cotton is hydrolysed more rapidly than unmercerized, and the properties of the resulting hydrocelluloses attain constancy at values significantly different from those characteristic of unmercerized cotton and such as represent a greater extent of hydrolytic degradation of the cellulose. This is attributed to the presence of a greater proportion of the more accessible amorphous phase. In some respects the heterogeneous hydrolysis of cotton cellulose by acids closely parallels its oxidation degradation by dilute solutions of chromic acid.

## Cellulose Trityl Ether

**Cellulose trityl ether.** W. M. Hearon, Gordon D. Hiatt, and Charles R. Fordyce. *J. Am. Chem. Soc.* 65, 2449–52 (Dec. 1943).

Cellulose trityl (triphenylmethyl) ether is best prepared from regenerated celluloses by the action of trityl chloride in dry pyridine. Products with 1.0 to 1.2 trityl groups per glucose were obtained. The tritylation reaction has been shown to be 13.8 times as fast with the primary as with the average of secondary hydroxyl groups.

## Esterifications of Cellulose

**Esterifications of cellulose by the vapors of acids and acid anhydrides.** G. Champetier and M. Foex. *Bull. Soc. Chim. de France* 9(5), 711–13 (July–Aug. 1942) (Through *Kodak Abst. Bull.* Sept. 1943).

A high degree of nitration is quickly obtained by treating cotton with pure nitric acid vapor, i.e., a product containing 13.8 percent nitrogen results after 2 hours at 40° C. at 50 mm. pressure. The extent of nitration is rapidly reduced by admixture of small amounts of water vapor. The degree of acetylation with acetic acid and acetic anhydrate vapors is very low, corresponding to the liquid phase reactions in the absence of catalyst. Thus, an acetyated product having 6 percent acetyl is obtained after 125 hours in acetic vapor at 120° C. and 760 mm. pressure and 16.6 percent acetyl after 200 hours in acetic anhydride vapor at 150° C. and 760 mm. Formic acid vapor gives 5.9 percent formyl after 48 hours at 105° C.

## Stabilized Oxidized Cotton

**Stabilization of oxidized cotton.** Richard E. Reeves. *Ind. Eng. Chem.* 35, 1281–83 (Dec. 1943).

When cellulosic materials are oxidized with periodate, the carbon-carbon bond be-

tween carbons 1 and 2 is broken and a dialdehyde is formed. There is a small loss in the strength of the cotton after oxidization with periodate but, if subsequently washed with alkali, a much greater loss takes place. Treatment of the periodate oxidized cotton with either sodium chlorite at pH 4 or diazomethane resulted in a stabilization of the material. The loss in weight, loss in strength and change in cuprammonium viscosity upon subsequent treatment with alkali was decreased. It is suggested that the chlorite treatment changes the aldehyde groups to carboxyl groups.

## Adsorption by Jute

**The adsorption of water by jute.** A. Powrie and J. B. Speakman. *J. Text. Inst.* 34, T77–86 (Oct. 1943).

Eleven samples of jute of known commercial quality have been analysed for cellulose content, xylan content of the cellulose, furfural yield, and lignin content. Although the lowest qualities of jute were found to have the highest and lowest contents of lignin and cellulose, respectively, no simple connection between constitution and quality could be established. Adsorption and desorption isotherms have been determined at 25° C. with six of the samples of jute, selected so as to include two samples each of white jute of high and low quality, one sample of red jute, and a sample of *Hibiscus cannabinus*, a jute substitute. In all cases, the adsorption and desorption isotherms, between which there is considerable hysteresis, are sigmoid in shape. Different kinds of jute differ considerably in their affinity for water, and there is a general tendency for the regain at any particular humidity to increase with increasing xylan + lignin content. As would be expected, therefore, the jute of highest quality was found to possess the lowest affinity for water. In addition, one of the two samples of poor quality had the highest affinity for water, and although the second sample had a much lower affinity than the first, this lower affinity was higher than that of any of the samples of better quality.

## Effect of Light

**Effect of light in the Van Slyke method for the determination of amino groups.** H. Fraenkel-Conrat. *J. Biol. Chem.* 148, 453–54, No. 2 (May 1943) (through *Kodak Abs. Bull.* Sept. 1943).

High Van Slyke values by the manometric method for amino acids containing the phenolic group, such as tyrosine, were traced to the effect of light on the reaction. Acetylation of the phenolic group prevented the photoreaction.

## New Nylon Products

**New nylon products made by reaction with synthetic resins.** Anon. *Silk and Rayon* 17, 796 (Nov. 1943).

Attention is called to the possibilities of E.P. 545,940 and 545,941 which describe products obtained by co-polymerizing nylon and other resins such as phenol formaldehyde. Under the proper conditions it is possible to produce unique products with interesting properties. If not over 30% resin is used the products of the co-polymerization may be spun into fibers or made into films. As the amount of resin increases, the softening point and moisture absorption are lowered but the tensile strength is not much affected. From the textile finisher's viewpoint it would seem that these new products are worth investigation. Most probably they can be dispersed to form aqueous emulsions, or at least can be dissolved in organic solvents capable of being applied to fabrics.

## Oriented Fibrous Proteins

**Conversion of globular to oriented fibrous proteins. I. By heat and mechanical working.** Frederick R. Senti, C. Roland Eddy, George C. Nutting. *J. Amer. Chem. Soc.* 65, 2473 (Dec. 1943).

Lactoglobulin, ovalbumin and a number of proteins after heating in water and stretching show an x-ray diffraction pattern similar to beta-keratin. Tensile strength measurements have shown that the strength of casein, lactoglobulin and ovalbumin filaments is greatly increased.

(*Continued on Next Page*)

## Protein Structure

**The role of glycine in protein structure.** Hans Neurath. *J. Am. Chem. Soc.* **65**, 2039–41 (Oct. 1943).

Recent discussions of protein structure have emphasized the importance of the amino acid side chains in determining the structure of fibrous or globular proteins. The presence of glycine with its small cross-sectional area in a polypeptide chain may confer a considerable degree of flexibility and internal rotation to the chain. A favorable periodic distribution of glycine residues along a protein chain might thus account for several phenomena which would otherwise appear to be unlikely due to steric hindrance. Among these phenomena are: the selective, orientation of side chains in monomolecular protein films, and the folding of polypeptide chains.

## Viscosity of Acetate Fractions

**Osmotic pressure and viscosity. Measurements with cellulose acetate fractions.** A. Bartovics and H. Mark. *J. Am. Chem. Soc.* **65**, 1901–05 (Oct. 1943).

The specific viscosities of cellulose acetate fractions were determined at various concentrations (up to 0.5 volume percent of the solute). Osmotic pressures of the same fractions were measured at various concentrations (up to 0.8 weight percent of the solute). It is concluded from the data that the relation between the specific viscosity ($\eta$), and the molecular weight, M, of cellulose acetate is given by the equation,

$$(\eta) = KM^a, \text{ where } K = 1.04 \times 10^{-2} \text{ and } a = 0.67.$$

This equation holds only for dilute solutions, and for fractions with a molecular weight greater than 5000.

## Absolute X-Ray Wave Lengths

**Absolute x-ray wave lengths.** H. Pipson and D. P. Riley. *Nature* **151**, 250–1 (Feb. 27, 1943) (through *Kodak Abs. Bull.* Sept. 1943).

At present, lattice spacings of crystals are based on the Siegbahn x-unit, defined as 1/2814.00 of the 200 spacing of rocksalt. This made the x-unit as near as possible to 0.001 A. in the light of the then known value of Avogardro's number $N_o$. Present measurements of $N_o$ show that the x-unit must be increased by about 0.2 percent to make it equal to 0.001 A. It is suggested that the new wave-length scale in angstroms should be adopted.

# DYEING: BLEACHING: FINISHING

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## Dyeing Acetate Rayon

**Coloring of acetate rayon with volatile dyes.** Anon. *Silk and Rayon* **17**, 790 (Nov. 1943).

It is possible to dye acetate rayon materials under dry conditions by exposing them to the vapor arising from heated dyes. Dyes suitable for this process generally do not contain sulphonic acid groups. This dyeing technique is based on the ability of acetate rayon to act as a solid organic solvent for dyes. It thus seems likely that the newer fibers such as nylon and vinyon may be amenable to this novel method of producing coloring.

## Dyeing Rayon Hosiery

**Outline of methods for dyeing and finishing rayon hosiery.** Virgil Hartkuist. *Textile Age* **7**, 46–54 (Nov. 1943).

A review and discussion of methods for processing acetate, Bemberg and Viscose hosiery.

## Fastness to Weathering

**Fastness to weathering of the army O.D. shade dyed by the monochrome method.** N. G. Koehler. *Am. Dyestuff Reptr.* **32**, 481–2, 484 (Nov. 8, 1943).

Thirty days exposure to weather was found to cause serious fading of the standard O.D. shade on wool, including dyeings of the types currently accepted by the Army, and tests were made to determine whether improvement in fastness to weather was possible. Dyestuffs were chosen which were suitable for dyeing by the chromate process, and from these, fifty combinations were made approximating the green shade component of the O.D. blend and exposed to the weather, together with controls dyed by the afterchrome method, for thirty days.

From the results it was concluded that the yellow dye component of the combinations exerted the greatest influence on weathering fastness. The combination: Acid Alizarine Flavine RA, Acid Anthracene Brown LE and Monochrome Black Blue GA produced a shade much faster to weathering in respect both to change in shade and to change in depth than any other combination tested and proved a great deal faster than the present acceptable standard. Further tests on the actual dyeing procedure brought out the point that allowing sufficient time for complete coupling of the chrome is much more important than variation in the amount of chrome used.

## Fluorescent Dyes

**Fluorescent dyes in coatings and plastics.** Henry E. Millson and Clifton C. Candee. *Modern Plastics* **21**, No. 4, 126–28, 160 (Dec. 1943).

Major difficulties are encountered in formulating with fluorescent dyes that are absent where other types of dyes are concerned. Maintaining maximum fluorescent brilliance while matching a given shade requires very careful and intelligent formulating. Shade matching with fluorescent colors not only presents those problems ordinarily encountered in color work, but also is complicated by the fact that the fluorescent color may be entirely different from that of the visible light color. The usual color matching rules do not apply, e.g.; two dyes, one of which fluoresces blue, and the other yellow, when used alone, may fluoresce yellow when mixed rather than green as might be anticipated. Some of the more important facts to be considered in formulating with these dyes on plastics are discussed and sample formulations are given. A table of qualitative solubilities of 21 fluorescent dyes in 25 solvents or solvent mixtures is given.

## Textile Printing

**The printing of textiles.** John R. Abrams. *Interchem. Rev.* **2**, 67–73 (Winter, 1943).

An outline is given of the development of the art of textile printing. Early processes are illustrated and described, as well as modern methods including the application of Aridye pigment colors.

## Peroxide Bleaching

**Continuous peroxide bleaching.** Dehaven Butterworth. *Textile World* **93**, 78–9 (Dec. 1943).

Peroxide pleaching of herringbone twill and other army fabrics at a speed of 125 yd. per min. and lighter fabrics at speeds as high as 150 yd. per min. is made possible by methods which are illustrated and described.

## Slashing Methods

**Slashing methods in sixteen mills.** Anon. *Textile World* **93**, 72–3 (Dec. 1943).

A summary and tabulation of methods employed for sizing cotton warps as reported by 16 mills at a "meeting by mail" conducted by the Textile Operating Executives of Georgia.

## Warp Sizing

**The warp sizing of man-made yarns.** Anon. *Rayon Tex. Mo.* **24**, 68–70 (Nov. 1943).

A defoamed gelatine was used as the size in these tests in which the effect of different types of softeners on the properties of a gelatine film were studied. It is shown that the viscosity of a sizing solution affects the amount of size taken up by the warp yarns. Generally a softener will have an effect on a given gelatine solution. Gelatine films were prepared and enlarged photographs shown. It is shown that the more uniform the gelatine film, the more even is the size distribution on the yarn. A variation occurred in the solubility of the oils before and after the goods were exposed to an accelerated ageing test. Some practical, tested operating formulas are given.

## New Mildewproofing Agent

**2,3-Dichloro-1,4-Naphthoquinone — a potent organic fungicide.** W. P. ter Horst and E. L. Felix. *Ind. Eng. Chem.* **35**, 1255–59 (Dec. 1943).

2,3-dichloro-1,4-naphthoquinine is outstanding in fungicidal properties among the many naphthoquinones tested. It is quite soluble (4%) in Xylene and 0-dichlorobenzene and fairly soluble in dioxane, acetone, benzene, and diethyl ether. The solu-

bility in water at pH 7.0 is in the order of 1 to 10,000,000. Its effectiveness in the control of numerous economic fungi has been demonstrated. In agriculture, it may be used as a seed treatment or as a foliage spray to control plant diseases. On cotton fabrics, soil burial tests show that 2,3-dichloro-1,4-naphthoquinone is effective against Chaetomium, Metarrhizium, Stachybotrys, Aspergillus and Penicillium. On light cotton sheeting 0.1% is effective, on duck 0.5 to 1.0% is necessary. Applicaaqueous suspension by simple immersion tion may be made from organic solvents or and subsequent drying. Other methods of application are in lacquer or as a vapor.

## FIBERS: YARNS: FABRICS: MECHANICAL PROCESSES

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### Color Fastness and Physical Properties

**The color fastness and physical properties of wool and rayon gabardines.** Hazel M. Fletcher and Hazel Marie Scott Sherwood. *Am. Dyestuff Reptr.* **32**, 280, 291–96 (June 21, 1943).

Nine viscose and cellulose acetate mixed fabrics and nine all-wool fabrics were studied. The statistical analysis of the data on fading of the colored fabrics showed that neither the rayon nor the wool was superior. Dry cleaning had little effect on the color in both groups of fabrics. There was not a significant difference between fadings due to light and heat, but both produced considerably more fading than dry cleaning. The white rayon showed no change in color on exposure to light, but the wool turned yellow. On heating both turned, but the wool showed the greater color change. The breaking strength of the rayon gabardine was greater than the wool gabardine. Moisture decreased the breaking strength of the wool less than that of the rayon, and the wool was more resistant to abrasion. Heat did not decrease the breaking strength of either significantly. Light decreased the strength of the wool much more than that of the rayon. When dry the wool had greater elongation than the rayon. Light, heat and abrasion, decreased the elongation of wool more than that of the rayon. Moisture greatly increased the elongation of the wool gabardines but did not significantly change that of the rayon. Dry cleaning did not decrease the breaking strength of the wool but decreased the rayon slightly. Dry cleaning did not affect the elongation. There was no significant difference in shrinkage of the two groups of fabrics. Neither the wool nor the rayon gabardines shrank excessively with dry cleaning. Both shrank more in the warp than in the filling. The wool increased in shrinkage with successive dry cleanings, but the rayon did not. The load-elongation curves showed that the rayon yarns were definitely different from the wool. The rayon showed a tendency for sudden yield points and exhibited some plastic flow, but the wool did not. The rayon was more wiry in "feel," and the wool had a softer "hand." Dry cleaning had no apparent affect on the dynamic properties of the yarns. The thermal conductivity of the wool gaberdines was definitely less than the rayon. Dry cleaning did not affect the conductivity of either group of fabrics.

### Fibers from Egg Albumen

**The molecular structure of fibers made from native egg albumin.** K. J. Palmer and James A. Galvin. *J. Amer. Chem. Soc.* **65**, 2187–90 (Nov. 1943).

Fibers which were made from native egg albumin by a process which involves complex formation with detergent, and drawing under steam, are shown to be composed of parallel bundles of polypeptide chains running parallel to the fiber axis. The peptide chains are shown to have the $\beta$-keratin configuration as is evident from the similar appearance of the x-ray patterns obtained from the albumin fibers as compared with those obtained from well oriented $\beta$-keratin. The tensile strength of the synthetic pure protein fiber is shown to be dependent upon the degree of molecular orientation and reaches a value of 38,000 pounds per square inch.

### Saving Fiber in Card Strips

**Why waste spinnable cotton?** E. H. Holliwell. *Textile World* **93**, 90–2 (Nov. 1943).

Results of experiments with changes in flat speeds and settings on the cotton card showed significant and worth while savings in the amount of usable fiber customarily found in card strips. Results of these tests indicate the possible need for changes in machine design. Suggested card settings are given.

## Styling and Designing

**Place and functions of the stylist. Styling and designing consumer fabrics for postwar markets, Part I.** Thomas O. Ott, Jr. *Textile World* **93**, 79–82 (Sept. 1943).

The article outlines briefly the changes needed in manufacturing and selling organizations before a company enters the consumer fabric field and then discusses in detail the place and functions of the stylist. Organization charts are presented for two types of organization: one in which the stylist is located at sales office and the designer at the mill, and the other in which both stylist and designer are located at sales office near the market.

**Place and functions of the designer. Styling and designing consumer fabrics for postwar markets. Part II.** Thomas O. Ott, Jr. *Textile World* **93**, 70–72 (Oct. 1943).

The place and functions of the designer are outlined. Some of his problems are discussed. Types of design paper and their use are described and a tentative fabric specification record is shown.

## Wearing Qualities of Hose

**The wearing qualities of rayon hose compared with silk and nylon hose.** Hazel M. Fletcher. *Rayon Tex. Mo.* **24**, 57–8 (Oct. 1943). *Ibid.*, 81–3 (Nov. 1943).

Laboratory analyses and actual wear tests were conducted. The nylon hose were worn an average of 515.60 hours, the silk 153.99 hours, and the rayon 305.82 hours. The bursting strength at knee, leg, and ankle was not significantly different between silk and nylon, or between silk and rayon. However, nylon showed greater bursting strength than did rayon. At heel and toe silk showed greater strength than nylon and nylon greater than rayon. Data for the worn hose showed nylon and silk significantly stronger than rayon, but nylon was stronger than silk only at the knee. Several pairs of the rayon wore out in heel and toes. On the basis of a 15 hour day the rayon hose cost $0.53 per day as compared to $.101 for the silk and $0.039 for the nylon.

## Wool Substitutes

**Wool substitutes.** Anon. *Silk and Rayon* **17**, 910–14 (Dec. 1943).

It is now possible to make artificial fibers having the same thickness and length as wool fibers and similar dyeing properties. With one exception, Lanital, these substitutes do not felt in the manner that wool does. Generally rayon fibers cannot be made into fabrics having the warmth of wool, but by special finishing methods the difference between the two types of material can be much reduced.

## Calendering

**The calendering of cotton and rayon fabrics.** Anon. *Silk and Rayon* **17**, 798–818 (Nov. 1943).

Calendering is one of those practical operations which is often best understood by the operative rather than the student of textile technology. The possibilities and limitations of this method of achieving luster and smoothness are discussed. Due to the manner in which the fiber structure of rayon differs from that of cotton, rayon fibers are more plastic than cotton and are therefore affected more by the calendering operation. A new method of calendering is described which is claimed to give fabrics a permanent luster similar to that acheived by mercerization. This method involves running the fabric while wet over a superheated metal bowl in such a way that the fabric emerges from the nip in a dry condition.

## Creases in Fulling

**Mill rigging.** G. L. Atkinson. *Textile Colorist* **65**, 475–6 (Nov. 1943).

Common causes of rigging or creasing are discussed. Methods are outlined which will assist in eliminating the fault, particularly in regard to the fulling of the lighter weight

cloths which most easily will rig. The use of the new spinner plate draft board is described. Another method which helps is "bagging" the cloth. Success has been had by attaching suitable spouts, fitted close up to scouring rollers of the rope dolly, or the open width washing machine. This keeps the cloth bunched and prevents the full flattening of the piece that occurs on the ordinary dolly. It has been found possible to give fabrics that are subject to mill rigging, a light milling, taking them out when signs of marking become apparent, carrying the milling further forward and bringing the piece to pattern in the manner given. A method involving brushing is also described that has been successful in treating pieces so badly rigged that they have been incurable by ordinary means.

## Aralac

**Aralac.** Rhode Island Section AATCC (paper presented at 1943 Intersection Contest). *Am. Dyestuff Reptr.* **32**, 532–33 (Nov. 22, 1943).

The present status of Aralac, its chemical and physical properties, and methods of wet processing Aralac fiber and fabric are discussed. Due to the present emergency domestic casein is being supplemented by Argentine casein in the manufacture of this fiber. The fiber is produced in three diameters and cut into staple fiber of various lengths, being ordinarily blended with wool or other fibers when it is to be made into fabric. It is readily dyed (ordinarily in top form) by the usual wool dyestuffs, and afterwards blended as desired. The following precautions in handling Aralac blends are suggested: (1) since Aralac has only thirty percent of the wet strength of wool care in wet treatment is important, (2) the wet processes must be otherwise controlled carefully because Aralac is more sensitive to high pH than is wool and the fastness of dyestuffs is generally less on Aralac than on wool, (3) carbonizing may be carried out provided temperatures are not excessive, (4) drying should be carried out at temperatures not much over 212° F., and (5) provision must be made for Aralac's greater shrinkage compared to wool. Although inferior in contrast to wool, it should be mentioned that Aralac has greater resistance to water and heat than any other casein fiber.

## Processing Acetate Hosiery

**The processing of acetate full-fashioned hosiery.** South Central Section AATCC (paper presented at 1943 Intersectional Contest). *Am. Dyestuff Reptr.* **32**, 524–26, 538 (Nov. 22, 1943).

The use of acetate rayon is comparatively new to most full-fashioned hosiery processors. A general processing method found satisfactory in the plant is described and various practical handling hints are suggested. Acetate hosiery of this type requires boarding before dyeing and finishing and this pre-boarding operation is most important. Pre-boarding tests carried out at temperatures from 190° to 235° F. (depending on steam pressure) showed decreasing tensile strength and increasing loss of color with rise in temperature. A temperature of 210° F. was found to give the lowest strength loss consistent with freedom from wrinkles and generally good color appearance.

## Textile-Plastic Combinations

**A study of textile fibers and fabric construction as factors influencing adhesion of textile-plastic combinations.** New York Section AATCC (winner of third prize, 1943 Intersectional Contest). *Am. Dyestuff Reptr.* **32**, 513–23 (Nov. 22, 1943).

Although a large volume of textile-plastic combinations is being produced, there has been little information published to guide finishers in selecting, developing or preparing fabrics specifically for such combination use. The present study was intended to help fill the need for such scientific data and is chiefly concerned with the important item of adhesion between plastic and fabric. A rapid method for making test laminations was developed using a fused collar press. The lamination was brought about by placing a 2 by 6 by .008 inch piece of plastic compound against the crease on the inside of a 3 by 14 inch strip of fabric folded to a 3 by 7 inch dimension and applying a standard pressure (75 lbs./sq. in.) for a standard time (30 sec.) at one or more of the three temperatures 225, 275 and 325°

F. The bond strength was measured by pulling the layers apart on a Scott Testing Machine. Five plastic compounds currently used for coating and lamination of textiles were laminated with each of twenty different types of fabric and the results charted. Interesting information regarding the effects of fabric construction and finish on the adhesion of plastics is given. For example, cotton corduroy gave a much stronger bond with all plastics tested than did acetate satin, except when cellulose acetate plastic was employed in which case the satin gave much the better bond; unfinished poplin produced stronger bonds in all tests than did the same poplin treated to make it water-repellent. Photographs of the fabrics used are presented.

## MISCELLANEOUS

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### Electron Microscopy

**A bibliography of electron microscopy.** C. Marton and S. Sass. *J. Applied Phys.* **14**, 522–31 (Oct. 1943).

A bibliography of electron microscopy is given for the first ten years of its development. The material is arranged in eight categories: 1. Books; 2. Emission Microscopy; 3. Transmission Type Microscope; 4. Optics of the Transmission Type Electron Microscope; 5. Image Defects; 6. Electron Speeds above 100 Kv.; 7. Different Related Instruments; 8. Applications of the Transmission Type Microscope.

### Evaluation of Detergents

**A proposed method for the evaluation of detergents.** V. B. Holland and A. Petrea. *Am. Dyestuff Reptr.* **32**, 534–37 (Nov. 22, 1943).

Previous methods for evaluating detergents have involved the removal of a standard soil from a given fabric and measurement of results in terms of the reflectivity or brightness increase of the washed fabric. The present authors propose that such measurement be supplanted or at least supplemented by a determination of percent soil removal and of solvent-extractable soil remaining in the fabric. Such determinations have been made using a variety of detergents, each in several concentrations and this information is presented in table form.

### Infra-Red Photography

**Infra-red photography.** Frederick B. Gleason, Jr. *Interchem. Rev.* **2**, 23–8 (Summer, 1943).

An outline of the advantages and limitations of infra-red photography. Some suggestions on technique are given.

### National Scientific Agencies

**Mobilization of scientific resources. III.** Anon. *J. Applied Physics* **14**, 373–405 (Aug. 1943).

A description of the organization and activities of: National Academy of Sciences; National Research Council; National Roster of Scientific and Specialized Personnel; National Inventors Council; Office of Scientific Research and Development; Office of Production Research and Development; and National Advisory Committee for Aeronautics.

### Bagging from Flax

**Bagging from domestic flax.** Joseph B. Hosmer. *Textile World* **93**, 6, 104–05 (June 1943); *Textile Bulletin* **64**, 11–14, **60** (June 15, 1943); *Cotton* **107**, 75–78 (June 1943).

Tests made at the State Engineering Experiment Station, Georgia School of Technology, show that flax fibers derived from field-retted seed flax can be processed by the Tech Flax process cheaply enough (for wartime) to give 100% flax yarns for burlap bagging which are generally superior to other jute substitutes; and 100% flax twine ranging from 0.21s to 0.25s suitable for binder twine. The decortication methods ordinarily employed in the Northwestern states produce from a half to two thirds as much useable fiber as might be obtained from the straw by the simple and less crude Tech Flax process. Tech Flax bagging is stronger than both jute standard and osnaburg. The general procedures worked out in the pilot plant at the Engineering Experiment Station for the utilization of field-retted seed flax can be used by the average cotton mill. That flax may

profitably be grown in South Georgia as a winter crop is being given postwar consideration. Six years of research at the Experiment Station show that (1) seed flax offers more farm profit than fiber flax; (2) tank retting and decorticating make the better basis for an eventual flax industry; (3) by segregating the long and short fibers on a French worsted comber, 100% flax of very fine counts may be spun from the longer fibers, the shorter being suitable for use in towelling in mixture with cotton; (4) the chemical degumming process has definite possibilities, but thus far an agricultural development based on this process would appear to be too costly. Mill experience derived from the retted-decorticated and refined fiber may ultimately solve the problem of spinning fine yarns from this type of fiber.

## Labor-Management

**Labor-management committees.** Anon. *Textile World* 93, 64–8, 125–8 (Dec. 1943).

The principle of labor-management committees recommended and sponsored by WPB has been adopted voluntarily and is in operation at 30 textile mills. A brief outline of the plan is given. The operation of this plan in the plants of Avondale Mills is reported.

## Novel Plan Eases Manpower Shortage

**"War Corps" utilizes young men.** Anon. *Textile World* 93, 86–87 (Sept. 1943).

An innovation in effect at the Firth Carpet Co., of Firthcliffe, N. Y., has been successful in helping keep up production at the plant and at the same time is giving valuable experience in industry to young men of school age. Selected young men from surrounding schools have been organized into a group known as the Firth War Corps. They work in the Firth Mills after school hours from four to six P.M., and eight hours on Saturday. Organized as a self-governing group under a captain selected from within the group excellent discipline has been maintained. The corps has assigned to it all sorts of odd jobs around the plant, with the work rotated so that no one has to continue too long at one of these routine jobs. They are also given an opportunity to assist in various departments of the mill.

## Quality Control

**Quality control charts.** A. G. Ashcroft. *Textile World* 93, 69–71 (Dec. 1943).

Adoption by Government procurement agencies of statistical methods for control of quality of products purchased makes it imperative for manufactures to familiarize themselves with these new techniques and to apply them in their own mills. Companies which have already put these methods to their own use find they are of value not only in helping to meet specifications for military use but also in saving manpower and critical materials through reduction in waste. The control chart is a method that assists in judging the significance of variations in the quality record plotted on it daily. The indication that action should be taken to find causes for changes in quality when plotted values fall outside control limits is its most valuable addition to the technique of quality control.

The development and application of control charts are outlined. Charts are shown for controlling weight, strength and yarns per inch of Army blankets; for controlling quality of No. 6 hard-texture duck; and for record of the porosity or leakage value of cotton duck.

## Soviet Education

**Engineering education in the Soviet Union.** J. G. Tolpin. *Chem. Eng. News* 21, 2090–99 (Dec. 25, 1943).

A general outline is given of the program in operation in the Soviet Union for the education and training of personnel in engineering, science and in research. Examples are shown of the practical application of methods employed. An analysis of the available information supports the claim that great achievements have been made. It is stated that the reconstruction period is certain to bring the Soviet engineer closer than ever to the American engineer.